Performance Metrics Explained

- Performance metrics is a measure to evaluate our model.
- Performance metrics are divided as follows:
    - Classification metrics
    - Regression metrics

- Classification **metrics** are as follows:
    1. Confusion Matrix
    2. Accuracy
    3. Precision
    4. Recall
    5. Specificity
    6. F1-Score
    7. AUC

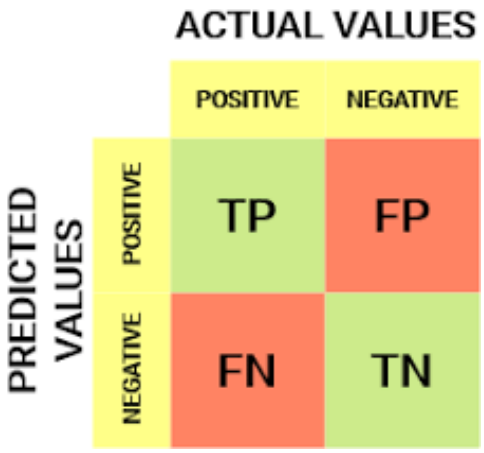
- Classification **Performance charts** are as follows:
    1. ROC Curve
    2. Precision-Recall Curve

- Regression metrics are as follows:
    1. MAE
    2. MSE
    3. RMSE

Classification Metrics

1. Confusion Matrix:

- True Positive, True Negative, False Positive and False Negative are usually presented in a tabular format in the so-called Confusion Matrix.
- Type I error: aka FP, if type I error is dangerous use precision metrics (spam does not spam email)
- Type II error: aka FN, if type II error is dangerous use recall metrics (person having cancer or not)



2. Accuracy:

- Accuracy is the fraction of predictions our model got right.
- Accuracy ranges between 0 and 1.
- Accuracy is misleading for imbalanced datasets.

$$\text{Accuracy} = \frac{(TP + TN)}{(TP + FP + TN + FN)}$$

3. Precision:

$$\text{Precision} = \frac{TP}{TP + FP}$$

- Precision is defined as **What proportion of predicted positives are truly positive.**
- Used where FP is dangerous and required this value less than FN (e.g.: email spam or not)

4. Recall: (aka sensitivity/ True positive rate/ Hit rate)

$$\text{Recall} = \frac{TP}{TP + FN}$$

- Recall is defined as **What proportion of actual positives are correctly classified.**
- Used where FN is dangerous and required this value less than FP (e.g.: person having cancer or not)

5. Specificity: (aka False positive rate/ Selectivity)

$$\text{Specificity} = \frac{\text{True Negatives}}{\text{True Negatives} + \text{False Positives}}$$

- Specificity is defined as **What proportion of actual negatives are correctly classified.**

6. F1-Score:

$$F1\ Score = 2 \times \frac{recall \times precision}{recall + precision}$$

- F1-Score is **harmonic mean** of Precision and Recall

7. AUC: (Area Under ROC Curve)